

Appl. No. 10/720,512
Amdt. dated September 20, 2005
Reply to Office action of June 24, 2005

Attorney Docket No. 1999B060/3

Amendments to the Specification:

Please amend the specification as indicated below:

Please substitute the following paragraph for that paragraph beginning at page 1, line 11 of the specification;

The present invention relates to the use of propylene copolymers in adhesive applications. A specific embodiment of the invention is directed to copolymers of propylene and ethylene or propylene and at least one C₄ to C₂₀ α -olefin, preferably a C₄ to C₈ α -olefin where the propylene is the predominant monomer and the copolymer is semi-crystalline. Another specific embodiment of the invention relates to adhesive compositions and methods for making adhesive compositions with polymers or polymer blends having melt flow rates (MFRs) of 250 dg/min. at 230°C and higher. Certain specific embodiments of the invention involve the use of a free radical initiator, e.g., a peroxide.

Please substitute the following paragraph for that paragraph beginning at page 7, line 1 of the specification;

Certain specific embodiments of the invention relate to adhesive compositions that include a polymer or blend of polymers in which the polymer or blend of polymers themselves have an MFR greater than about 250 g/10 min. at 230°C, and processes for making such adhesive compositions. It is understood that while the overall composition may include additional ingredients that may further increase the overall MFR of the composition, it is the MFR of the actual polymer or polymer blend itself that is referred to herein. Advantageously, therefore, additional treatment steps, e.g., post-extrusion, or MFR-increasing additives are not necessarily required, since the polymer or blend of polymers itself possesses the desired MFR.

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Please substitute the following paragraph for that paragraph beginning at page 7, line 24 of the specification;

In other specific embodiments, adhesive compositions are described containing polymers or polymer blends having an MFR greater than about 250 dg/min. at 230°C, wherein the composition preferably includes a random copolymer produced by copolymerizing propylene and at least one of ethylene or alpha-olefin having 20 or less carbon atoms, preferably 8 or less carbon atoms, the random copolymer having a crystallinity at least about 2% and no greater than about 65% derived from stereoregular polypropylene sequences and a melting point of from about 25°C to about 105°C. Preferably, the random copolymer has a melting point.

Please substitute the following paragraph for that paragraph beginning at page 8, line 1 of the specification;

In still other specific embodiments, adhesive compositions are described, which include the reaction product of a free radical initiator and a random copolymer produced by copolymerizing propylene and at least one of ethylene or alpha-olefin having 8 or less carbon atoms, the random copolymer having a crystallinity at least about 2% and no greater than about 65% derived from stereoregular polypropylene sequences and a melting point of from about 25°C to about 105°C. Preferably, this reaction product has an MFR greater than about 250 g/10 min. at 230°C.

Please substitute the following paragraph for that paragraph beginning at page 8, line 8 of the specification;

Yet another specific embodiment of this invention includes a random polymer with a melting point between about 60°C and 140°C, more preferably between 80°C and 110°C. The viscosity as measured by melt flow rate at 230 NC should be between 2 and 5600, more preferably between 70 and 370, and most preferably between 300 and 1800. Correspondingly,

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the melt index, measured at 190°C, should be between 20 and 1500, more preferably between 40 and 1000, and most preferably between 100 and 500. Further, the tensile elongation of the polymer at room temperature should be in excess of 50%, more preferably in excess of 100%, and most preferably in excess of 300%. Preferably, the random copolymer is a low molecular weight copolymer containing propylene units in an amount of 80% or above, preferably more than 90%, with the propylene units preferably being predominantly isotactic sequences (more than 80% of the units being isotactic pentads), as measured by C-13 NMR. The random copolymers can have long chain branching, providing greater flexibility for desired rheological properties.

Please substitute the following paragraph for that paragraph beginning at page 9, line 7 of the specification;

Another specific embodiment of this invention relates to a process for making a modified adhesive composition. For example, a process is described that includes (a) providing a first polymer composition having an MFR less than 250 dg/min. at 230°C. and including a random copolymer produced by copolymerizing propylene and at least one of ethylene or alpha-olefin having 8 or less carbon atoms, the random copolymer having a crystallinity at least about 2% and no greater than about 65% derived from stereoregular polypropylene sequences and a melting point of from about 25°C to about 105°C; and (b) contacting the first polymer composition, in the melted state, with a free radical initiator, to provide a second polymer composition, wherein the second polymer composition has an MFR greater than 250 dg/min. at 230°C.

Please substitute the following paragraph for that paragraph beginning at page 33, line 1 of the specification;

Preferably, the adhesive composition of this invention is a blend that includes a crystalline polymer blended with the random copolymer. More specifically, the adhesive composition may be a blend that includes a crystalline polymer blended with the random copolymer, wherein the crystalline polymer has a melting point greater than at least about

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110°C. More narrowly, the crystalline polymer may have a melting point greater than about 115°C. More specifically, the crystalline polymer may have a melting point greater than about 130°C.

Please substitute the following paragraph for that paragraph beginning at page 37, line 23 of the specification;

The random copolymers may be substantially amorphous, but should be crystallizable and should have a crystallinity of at least about 2% and no greater than about 65%. The crystallinity of the random copolymer should be derived from stereoregular polypropylene sequences. The random copolymer may be crystallizable, meaning that they may be amorphous in an undeformed state, but upon stretching or annealing, crystallization may occur. In any event, the melting point of the random copolymer should be from about 25°C to about 105°C, and preferably less than 100°C. Further, the heat of fusion of the random copolymer should be less than 75 J/g as determined by DSC. A variety of comonomers may be used in forming the random copolymers described herein. Suitable comonomers include ethylene and alpha-olefins, such as C₄-C₂₀ alpha-olefins and preferably C₄-C₈ alpha-olefins. The alpha-olefin comonomer can be linear or branched, and two or more comonomers can be used, if desired. Examples of suitable comonomers include ethylene, linear C₄-C₈ alpha-olefins, and alpha-olefins having one or more C₁-C₃ alkyl branches. Specific examples include ethylene; 3-methyl-1-butene; 3,3-dimethyl-1-butene; 1-pentene; 1-pentene with one or more methyl, ethyl or propyl substituents; 1-hexene with one or more methyl, ethyl or propyl substituents; 1-heptene with one or more methyl, ethyl or propyl substituents; 1-octene with one or more methyl, ethyl or propyl substituents; 1-nonene with one or more methyl, ethyl or propyl substituents; ethyl, methyl or dimethyl-substituted 1-decene, or 1-dodecene. Preferred comonomers include ethylene, 1-butene, 1-pentene, 3-methyl-1-butene, 1-hexene, 3-methyl-1-pentene, 4-methyl-1-pentene, 3,3-dimethyl-1-butene, 1-heptene, 1-hexene with a methyl substituent on any of C₃-C₅, 1-pentene with two methyl substituents in any stoichiometrically acceptable combination on C₃ or C₄, 3-ethyl-1-pentene, 1-octene, 1-pentene with a methyl substituent on any of C₃ or C₄, 1-hexene

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with two methyl substituents in any stoichiometrically acceptable combination on C₃-C₅, 1-pentene with three methyl substituents in any stoichiometrically acceptable combination on C₃ or C₄, 1-hexene with an ethyl substituent on C₃ or C₄, 1-pentene with an ethyl substituent on C₃ and a methyl substituent in a stoichiometrically acceptable position on C₃ or C₄, 1-decene, 1-nonene, 1-nonene with a methyl substituent on any of C₃-C₉, 1-octene with two methyl substituents in any stoichiometrically acceptable combination on C₃-C₇, 1-heptene with three methyl substituents in any stoichiometrically acceptable combination on C₃-C₆, 1-octene with an ethyl substituent on any of C₃-C₇, 1-hexene with two ethyl substituents in any stoichiometrically acceptable combination on C₃ or C₄, and 1-dodecene. It should be appreciated that the list of comonomers above is merely exemplary, and is not intended to be limiting. A particularly preferred comonomer is ethylene.

Please substitute the following paragraph for that paragraph beginning at page 62, line 8 of the specification;

In this example, C2 samples were degraded in a laboratory intensive mixer/extruder at 190°C - 210°C with the peroxide initiator used in Example 10. Five different levels of peroxide were used (nominally 0.4, 0.8, 1.2, 1.6 and 2.0 wt%). Again, the actual levels of peroxide were slightly lower (about 8-10 wt%) for the experiments that used larger amounts of peroxide due to some material losses during transfer. A control sample (C2-0) was used for comparison purposes, having no peroxide added but subjected to the same shear forces in the single screw extruder as the other samples. Mechanical properties of the degraded polymers were also measured. The results for C2 are reported below in Tables 12 and 13.

Please substitute the following table for that table found at page 69 of the specification;

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TABLE 18

Physical Data	Sample A6	Sample B6 Achieve	Sample C6	Sample D6	Sample E6	Sample F6
Lupersol 101 (g)	---	---	5.56	8.79	13.3	2.93
MFR (mean)	10.480	55.140	442.811	804.895	1129.232	359.626
Std. Dev.	0.0188	0.0000	0.1443	0.2356	0.0000	0.1753
Var. Coeff.	0.1037	0.0000	0.2585	0.2319	0.0000	0.3867
Shear Rate (sec ⁻¹)	25.63	134.70	1081.65	1968.23	2759.64	878.64
Viscosity (Pascals)	757	144	18	10	7	22
Brookfield Viscosity (cps @ 190C)	---	---	49,200	28,000	22,400	60,500
Measured MI	---	---	---	361	517	161
Tm (°NC)	76.0	157.0	76.0	78.8	75.5	148.6
Heat of Fusion (J/g)	42.34	64.94	40.01	38.50	37.91	29.70
Tc (°NC)	13.5	104.7	16.9	22.3	18.6	98.0
Heat of Crystallization (J/g)	20.19	76.49	18.88	19.85	20.25	37.53
GPC						
Mn	93,300	---	35,000	29,600	25,500	38,600
Mw	164,900	---	67,900	60,600	55,000	75,800
Mz	255,200	---	110,800	107,600	100,700	124,800
Mw/Mn	1.77	---	1.94	2.05	2.16	1.96